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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/588,766	08/08/2006	Harald Kraus	4303-1009	2464

466 7590 11/21/2008

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EXAMINER	
CULBERT, ROBERTS P	
ART UNIT	PAPER NUMBER
1792	

MAIL DATE	DELIVERY MODE
11/21/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/588,766	KRAUS ET AL.	
	Examiner	Art Unit	
	Roberts Culbert	1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 October 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-17* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-17* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 10/30/08 has been entered.

Response to Arguments

Applicant's arguments filed 10/30/08 have been fully considered.

Applicant has argued that Christenson fails to teach a liquid flow that is continuous. Applicant focuses on the disclosure of spray processors, but does not address the fact that Christensen expressly recites (Paragraphs 42-43) that the method is suitable for "*any equipment where the etching solution is able to contact and etch the high-k material. For instance…immersed in a bath…either static, cascading or otherwise flowing*".

Applicant's arguments with respect to the amendments to the claims have been considered but are moot in view of the new ground(s) of rejection.

Tanaka teaches free beam etchant dispersion is a well known alternative to spray etching. (Figures 1-9 and Col. 1-10)

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-8, and 11-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent Application Publication 2003/0235985 to Christenson et al. in view of U.S. Patent 5,032,217 to Tanaka.

Regarding Claims 1-8, 14 and 16, Christenson et al. teaches a method of selective etching comprising: providing a first material selected from a group comprising materials with a high dielectric constant on a substrate and providing a second material (silicon dioxide) on a substrate and selectively etching said first material with a selectivity of at least 2:1 (Paragraph 30) towards said second material by a liquid etchant comprising fluoride ions (Paragraphs 32-35) flowing across the substrate surface at a flow of at least 0.05 L/min (especially at least 0.5L/min)

Regarding Claims 1 and 16, Christenson teach a continuous flow as a liquid stream onto the substrate may be provided which spreads over the surface (Paragraph 42) but does not expressly teach a free beam is used. However, Tanaka teaches free beam etchant dispersion is a well known alternative to spray etching. (Figures 1-9 and Col. 1-10) It would have been obvious to one of ordinary skill in the art at the time of invention to use a liquid stream or free beam in order to enable optical endpoint detection as recited by Tanaka.

Regarding Claims 1 and 16, Christenson teaches a flow which is “sufficient fast to” generate a mean velocity v parallel to the substrate's surface of minimum 0.1m/s as broadly recited by applicant using a free beam or liquid stream as shown in Tanaka. Thus one of ordinary skill in the art would have found it obvious at the time of invention to provide the claimed velocity as a matter of optimizing the process variables such as diameter (d), as shown in Fig. 5, and the experimental section of Tanaka. Note that in the experiment, d=4mm which provides the required velocity 0.1 m/s using the volume flow of 0.1 lpm as recited in Christenson.

Regarding Claim 2, 3 and 5, Christenson et al. teaches the liquid may be dispensed onto the substrate in a continuous flow as a liquid stream and spread over the substrate's surface (See *“cascading or otherwise flowing”* and *“supplied as a flow”* Paragraphs 42 and 43) in a time sequence and may be

rotated while exposed to said liquid etchant. (See *centrifugal spray processor*) Tanaka similarly teaches a rotated substrate for free beam etching processes.

Regarding Claim 11, Christenson et al. teach the liquid etchant is selected from a group comprising a solution comprising fluoride ions and an additive for lowering dielectric constant of said solution, an acidic, aqueous solution comprising fluoride ions, an acidic, aqueous solution comprising fluoride ions and an additive for lowering dielectric number e.g. an alcohol. (Paragraphs 32-38)

Regarding Claim 12, Christenson et al. teach the liquid etchant comprises an analytical concentration of less than 0.01 mol/l of fluoride ions, wherein said analytical concentration is calculated as F^-. (Paragraph 35)

Regarding Claim 13, Christenson et al. teach the liquid etchant comprises fluoride ions and has a pH value of below 3. (Paragraph 37)

Regarding Claim 15, Christenson et al. teach the liquid etchant comprises fluoride ions and an additive for lowering dielectric number such as an alcohol in prior art etching solutions. (Paragraph 8) Such would have been obvious to employ to one of ordinary skill in the art at the time of invention.

Claims 9, 10 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent Application Publication 2003/0235985 to Christenson et al. in view of U.S. Patent 5,032,217 to Tanaka and in further view of U.S. Patent application Publication to Buchanan et al.

Regarding Claims 9, 10 and 17, as applied above, Christenson et al. in view of Tanaka teach the method of the invention substantially as claimed including HfO_2 and ZrO_2 as the first material (Paragraph 8 and 22), but do not expressly teach the first material is subjected a pretreatment in order to damage the material's structure, wherein the pretreatment is an energetic particle bombardment.

Buchanan et al. teach a pretreatment consisting of energetic particle bombardment may be used prior to wet etching high-k metal oxide (Paragraph 30 teaches HfO_2 and ZrO_2) using fluoride or HF silicon oxide. It would have been obvious to one of ordinary skill in the art at the time of invention to use the conventional pre-treatment step in order to damage the metal oxide and increase the etch rate as taught by Buchanan et al.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Roberts Culbert whose telephone number is (571)272-1433. The examiner can normally be reached on Monday-Friday (8:30-5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571) 272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Roberts Culbert/
Primary Examiner, Art Unit 1792